CLAIMS

1. A stacked piezoelectric device comprising piezoelectric layers composed of a piezoelectric material and internal electrode layers containing Cu, each of the piezoelectric layers being stacked alternately with each of the internal electrode layers, wherein the internal electrode layer contains not less than 50 percent by weight of Cu element, and wherein, between the internal electrode layer and the piezoelectric layer, there is a diffusion region formed by mutual diffusion of components of the internal electrode layer and the piezoelectric layer to the other layer and comprising at least one component of the piezoelectric material and Cu.

2. A stacked piezoelectric device according to claim 1, wherein the internal electrode layer contains not less than 95.0 percent by weight of Cu element.

3. A stacked piezoelectric device according to claim 1, wherein the internal electrode layer contains not less than 99.0 percent by weight of Cu element.

4. A stacked piezoelectric device according to claim 1, wherein the internal electrode layer is composed of a pure copper metal containing not less than 99.0 percent by weight of Cu element.

5. A stacked piezoelectric device according to claim 1, wherein the internal electrode layer is composed of a copper alloy containing not less than 95.0 percent by weight of Cu element.

6. A stacked piezoelectric device according to claim 1, wherein the diffusion region occupies not less than 90 percent of area of interface between the internal electrode layer and the piezoelectric layer, and a thickness of the diffusion region is not more than 10 percent of a thickness of the internal electrode layer.

7. A stacked piezoelectric device according to claim 1, wherein the diffusion region is a region having a Cu concentration of 1 percent to 0.95A percent by weight, wherein A represents Cu element content in

percent by weight in the internal electrode layer.

8. A stacked piezoelectric device according to claim 1, wherein a thickness of the diffusion region is from 0.001 to 1 micrometer.

9. A stacked piezoelectric device according to claim 1, wherein the diffusion region exists continuously in both sides of an interface of the internal electrode layer and the piezoelectric layer, and the interface is located in the diffusion region, and wherein a part, closer to the internal electrode layer than the interface, of the diffusion region has an oxygen (O) content of not more than 10 percent by weight.

10. A stacked piezoelectric device according to claim 1, wherein the piezoelectric material constituting the piezoelectric layer comprises PZT which is a $Pb(Zr,Ti)O_3$-based oxide having a perovskite structure, and Pb, Cu, and O elements coexist in the diffusion region.

11. A stacked piezoelectric device according to claim 1, which is a piezoelectric actuator for an injector used as a driving source of an injector.

12. A method of fabricating a stacked piezoelectric device comprising piezoelectric layers composed of a piezoelectric material and internal electrode layers containing Cu, each of the piezoelectric layers being stacked alternately with each of the internal electrode layers, comprising the steps of:

a piezoelectric layer calcination step of calcining a ceramic green sheet as a piezoelectric material to obtain a piezoelectric layer;

a stack fabrication step of stacking the piezoelectric layers alternately with layers of electrode material containing Cu to fabricate a stack; and

a heat-bonding step of bonding internal electrode layers composed of the electrode material and the piezoelectric layers by heating the stack at a temperature higher than 750 degrees centigrade and not

higher than the melting point of Cu in an oxidation-inhibiting atmosphere for inhibiting Cu from oxidizing while a predetermined load is applied to the stack in the stacking direction.

13. A method of fabricating a stacked piezoelectric device according to claim 12, characterized by heating the stack at a temperature higher than 850 degrees centigrade in the heat-bonding step.

14. A method of fabricating a stacked piezoelectric device according to claim 12, wherein the electrode material is Cu foil.

15. A method of fabricating a stacked piezoelectric device according to claim 12, wherein the electrode material is Cu plating film formed on the surface of the piezoelectric layer.

16. A method of fabricating a stacked piezoelectric device according to claim 12, wherein the piezoelectric material constituting the piezoelectric layer comprises PZT which is a $Pb(Zr,Ti)O_3$-based oxide having a perovskite structure, and the stack is heated at a temperature of not less than 955 degrees centigrade in the heat-bonding step.

17. A method of fabricating a stacked piezoelectric device according to claim 12, wherein the oxidation-inhibiting atmosphere in the heat-bonding step is obtained by placing the stack in a furnace, filling the circumference of the stack with oxide ceramic powder, and evacuating the inside of the furnace to a vacuum degree of 1×10^{-4} Pa to 10^5 Pa.

18. A method of fabricating a stacked piezoelectric device according to claim 12, wherein the oxidation-inhibiting atmosphere in the heat-bonding step is obtained by evacuating the inside of the furnace, in which the stack is placed, to a vacuum degree of 1×10^{-4} Pa to 10^5 Pa, and thereafter introducing inert gas into the furnace so that a pressure of not less than 1 Pa may be maintained in the furnace.

19. A method of fabricating a stacked piezoelectric device according to claim 12, wherein the oxidation-inhibiting atmosphere in the heat-bonding step is obtained by evacuating the inside of the furnace, in which the stack is placed, to a vacuum degree of 1×10^{-4} Pa to 10^{5} Pa, and thereafter controlling an oxygen partial pressure in the furnace in the predetermined range.